CHAMBERS
ENVIRONMENTAL GROUP, INC.

July 6, 2010

Mr. Denny Wright
Pennsylvania Department of Environmental Protection
Environmental Cleanup Program
208 West Third Street, Suite 101
Williamsport, PA 17701

RE: Cleanup Plan – Plant 1
Former Cerro Metal Products Bellefonte Facility
Spring Township, Centre County, Pennsylvania
PADEP Facility ID #14-17981

Mr. Wright:

Chambers Environmental Group, Inc. (Chambers) is pleased to provide this Cleanup Plan for the remediation of unsaturated soil, saturated soil, and groundwater beneath the Plant 1 portion of the former Cerro Metal Products facility located in Bellefonte, Pennsylvania (PA) for your review and comment. This Cleanup Plan contains a brief summary of the project, a brief description of the regulatory structure, a conceptual site model, a brief summary of interim remedial activities completed in the Plant 1 area, and a description of the technology, methods, and procedures to be utilized for remediation.

Sincerely,

Matthew C. Whitman
Project Manager

Steven J. Treschow, P.G. CPG
Professional Geologist

Enclosure

cc: Mr. Ray Avendt, Ph.D., P.E., The Marmon Group
Mr. Gerrit Van Tilburg, Bolton Metal Products
P:\2000 PROJECTS\2008\08-061711 - Plant 1 Remediation Task 21\Cleanup Plan 07.01.10.doc

629 East Rolling Ridge Drive
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CLEANUP PLAN – PLANT 1 AREA
FORMER CERRO METAL PRODUCTS BELLEFONTE FACILITY
SPRING TOWNSHIP, CENTRE COUNTY, PENNSYLVANIA
PADEP FACILITY ID #14-17981

July 2010

Prepared for:

The Marmon Group, LLC
Chicago, Illinois

Prepared by:

Chambers Environmental Group, Inc.
Bellefonte, Pennsylvania

Reviewed by:

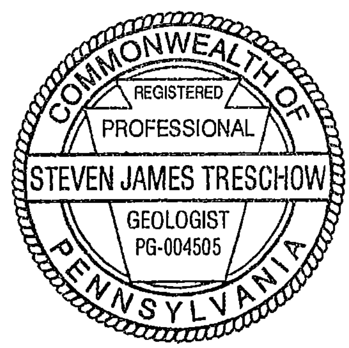
Steven James Treschow

Steven James Treschow, Professional Geologist

CHAMBERS
ENVIRONMENTAL GROUP, INC.

PROFESSIONAL GEOLOGIST CERTIFICATION

I, Steven James Treschow, a Registered Professional Geologist licensed in the Commonwealth of Pennsylvania (PG004505), have participated in the preparation of the document titled, *"Cleanup Plan – Plant 1 Area, Former Cerro Metal Products Bellefonte Facility, Spring Township, Centre County, Pennsylvania, PADEP Facility ID#14-17981"* I certify that the geologic and hydrogeologic content of this document, as prepared by the signing licensed Professional Geologist, are consistent with the applicable geologic and hydrogeologic standards of the Technical Guidance Manual for Pennsylvania's Land Recycling Program and Act 2.



Steven James Treschow, Professional Geologist

(Original Document bears Crimp Seal, Stamp, and Signature)

TABLE OF CONTENTS

LIST OF APPENDICIES

1.0 SUMMARY AND REGULATORY STRUCTURE

The Marmon Group, a Berkshire Hathaway Company (Marmon), previously owned the stock of Cerro, before selling the stock to Bolton MKM Corporation (Bolton). As part of the sale's agreement, Marmon retained the environmental liability for the site. Marmon contracted Chambers Environmental Group, Inc. (Chambers) to assist in the process of obtaining an Act 2 Relief of Liability for the site using Pennsylvania Department of Environmental Protection's (PADEP) Statewide Health Standard (SHS) or the Site Specific Standard (SSS).

The Cerro site consists of approximately 150 acres, 19 of which the plant is located on, the site characterization was conducted in multiple phases. As part of the characterization process, Marmon submitted revised Notice Of Intent to Remediate (NIR) documents in July of 2009 to address specific sites as defined in PA Code, Title 25, Chapter §250.1. The characterization resulted in the identification of six distinct areas: the North Yard, Plant 1, South Spring, Plant 4, South Yard, and the Eastern Hillside. Each of the six areas were characterized and the results of the investigation were summarized in Volume I of II of the March 31, 2010 Remedial Investigation Report (RIR) (Chambers, 2010). The site characterization revealed soils and groundwater beneath the Plant 1 portion of the site were impacted with volatile organic compounds (VOCs). The PADEP approved the RIR in correspondence dated July 2, 2010. The PADEP assigned the Plant 1 site Permitted Facility ID#722117 and Remedial ID #39036.

In accordance with PA Code, Title 25, Chapter § 250.410, a Cleanup Plan must be prepared when the SSS is a potential remedial goal for a site. The submission of this Cleanup Plan does not exclude the pursuit of SHS as a remedial goal, but is being prepared with the understanding that SSS may be the remedial goal for the site. Chapter 250.410 specifies that a Cleanup Plan should evaluate the relative abilities of the selected remedial alternative(s) to achieve the selected standard. Chambers and Marmon have prepared this Cleanup Plan which presents the remedial approach selected for the remediation of saturated soil and groundwater in the Plant 1 area.

2.0 CONCEPTUAL SITE MODEL AND INTERIM REMEDIAL ACTIONS

The subsurface media beneath Plant 1 can be divided into four general stratigraphic horizons: pavement/gravel fill, slag, natural silt loam/loam soil layer, and bedrock. VOCs (primarily trichloroethylene (TCE)) are present in both soil (unsaturated and saturated) and shallow groundwater along the northwestern portion of the Plant 1 area. Characterization revealed impacts to soil and groundwater were localized to the northwestern most portion of Plant 1 and not extensive across the entire Plant 1 area. Impacts to both soil and groundwater were adequately delineated as part of the site characterization.

Two soil excavations were completed in an effort to remove VOC mass from the soil profile in the area which reportedly contained the highest VOC concentrations. **Figure 1** depicts the combined area of the two soil excavations. Approximately 300 pounds of VOC contaminant mass was removed during the two excavations. Based upon post-excavation soil analytical data, further soil excavation would not be cost-effective as a remedial strategy.

Groundwater beneath the Plant 1 area first occurs in the slag horizon and extends into the natural soil below. The adjacent stream (Logan Branch) is hydraulically connected to groundwater beneath Plant 1. VOCs above the PADEP Used-Aquifer ($\leq$ 2,500 milligrams per liter (mg/L) total dissolved solids (TDS)) Non-Residential Statewide Health Standard (UANRSHS) Medium Specific Concentrations (MSCs) have not been identified in the point of compliance wells located adjacent to Logan Branch. The VOCs in groundwater are limited to the same general area as the soil excavation. A recovery sump was installed within the soil excavation to facilitate future groundwater remedial actions.

3.0 REMEDIAL TESTING, OBJECTIVES AND SCREENING

3.1 Remedial Feasibility Testing

Remedial feasibility testing was completed at the Plant 1 site in order to facilitate the selection of an appropriate remedial technology for impacted saturated soil and shallow groundwater.

- Soil Vapor Extraction (SVE) testing was completed with the results indicating SVE would not be an effective remedial alternative.
- Hydraulic testing of the Plant 1 area revealed groundwater could be extracted, but not at quantities sufficient for groundwater extraction and treatment to be the sole remedial technology.
- Vertex Environmental Inc. (Vertex) evaluated Bioremediation by evaluating geochemical and groundwater analytical data. Bioremediation was eliminated due to naturally high Oxidation-Reduction Potential (ORP) which indicates an oxidative environment. Bioremediation of TCE typically occurs in reducing conditions and reversing the naturally oxidative conditions in groundwater would be extremely difficult and costly.
- Vertex also evaluated In-Situ Chemical Oxidation (ISCO) by evaluating geochemical and groundwater analytical data. The relatively high ORP indicated strong reducing conditions do not have to be overcome prior to establishing oxidative conditions. In order to determine if ISCO was a cost effective remedial option, samples of the soils underlying Plant 1 were collected and submitted for analysis of the Natural Oxidant Demand (NOD). The results of the ISCO evaluation indicated favorable conditions for ISCO implementation.
- Monitored Natural Attenuation (MNA) was also evaluated as a potential remedial alternative. MNA of TCE typically occurs via reductive dechlorination which requires a reducing (non-oxidative) environment. The naturally high ORP is indicative of an oxidative environment and explains why the TCE has not been degraded.

3.2 Remedial Objectives

The purpose of the Cleanup Plan is to accomplish particular Remedial Action Objectives (RAOs). The RAOs for Plant 1 are as follows:

- To gain a further understanding of the hydraulics in the Plant 1 area (especially around the soil excavation area).
- To reduce concentrations of VOCs in saturated soil and groundwater via active remediation.
- Ensure minimal impacts to Logan Branch from selected remedial alternative.

3.3 Remedial Alternatives Summary

The inability to move a large volume of air or water eliminated groundwater extraction and SVE as the primary remedial technology for Plant 1 groundwater. In-Situ treatments were investigated because of their relative ease of implementation and in-situ breakdown and degradation of contaminants. Bioremediation and MNA were eliminated based upon naturally high ORP values in groundwater, the lack of contaminant breakdown products (such as dichloroethylene and vinyl chloride), and the relatively slow cleanup timeframe associated with both technologies.

A site-specific analysis completed by Vertex evaluated geochemical and groundwater analytical data to determine the most appropriate in-situ remedial technology. Vertex submitted samples from the Plant 1 area for analysis of NOD. NOD represents the amount of an oxidant that may be consumed by a given quantity of soil. In order to assess the quantity of oxidant which will be required to treat the VOCs, an understanding of the natural oxidant consumption of the soil matrix is critical. In addition to evaluating the NOD, Vertex can also estimate the residual contaminant mass in soil based upon post-excavation soil analytical results.

4.0 REMEDIAL CLEANUP PLAN

The goal of the remedial action is to treat groundwater with the added potential for treatment of both unsaturated soil (via direct contact to unsaturated soil immediately surrounding the shallow injection trench) and saturated soil (via dispersion after injections into deeper points). In order to conduct further treatment of unsaturated soil, physical mixing or additional shallow injections points would be required.

ISCO was selected as the remedial alternative based on the groundwater geochemistry (naturally oxidative conditions), the nature of the particular constituents of interest (volatile organics), and the soil chemistry (NOD values within typical range of soil which can be treated via ISCO). Vertex initially considered both permanganate and persulfate to be applicable to the site. Permanganate was not recommended due to its persistence in the subsurface and the greater potential for the permanganate to reach Logan Branch. Additionally, permanganate is typically applied at a lesser concentration which would require a larger volume of product in order to be effective.

Persulfate was recommended by Vertex as the most applicable ISCO treatment for groundwater underlying Plant 1. Persulfate was recommended because the solution is typically applied at a much higher concentration which will require fewer injections, and persulfate is not as likely to migrate to Logan Branch.

The persulfate is initially in a powdered form which is then blended with water until the desired solution (10-20%) is achieved. The persulfate solution will be dilute (thin) enough to pump with a submersible pump into the injection laterals/points. The persulfate is based-activated (i.e., an alkaline free radical reaction). Infiltration testing completed in Plant 1 provided data to estimate the conductivity of the native soil/slag (1×10^{-4} centimeters per second (cm/sec) or 0.0002 feet per minute (ft./min.)), but the movement of the persulfate in the gravel backfill is conservatively estimated at 1cm/sec or 2 ft./min.

The proposed ISCO injections doses are based upon the NOD testing of the Plant 1 soils/slag, the VOC mass estimate in soil and groundwater, and the historic experience of Vertex. Vertex is assuming a 3-5 gallon per minute (gpm) injection rate which is based upon past experience at similar sites. Vertex is hopeful that gravity injection will suffice and pressurized injection is not required. If pressurized injection is required, Vertex will complete a pressure step test to determine the optimal injection pressure.

The remedial treatment will be conducted using the following methods and procedures:

- Prior to initiating the treatment, Chambers will obtain necessary permits required by the PADEP and/or United States Environmental Protection Agency (USEPA).

- Chambers will complete a full round of groundwater monitoring at each accessible point (sump, injection points, and wells) for water levels, pH, ORP, dissolved oxygen (DO), and temperature. This information will establish geochemical baseline conditions in groundwater.

- Construct a shallow trench around the upgradient side of the excavation (see **Figure 1**). The trench will be 2 feet below ground surface (ft-bgs) and horizontal sections of perforated pipe will be installed in each trench. Injection ports will be installed at approximately 10 feet intervals for adequate oxidant distribution within the horizontal pipes.

- Install 14, 4" injection points (IP-1 through IP-14) to a depth of approximately 15 ft-bgs. Five of the injection points (IP-1 through IP-5) will be installed upgradient of the excavation, four injection points (IP-6 through IP-9) will be installed in the excavation, and five injections points (IP-10 through IP-14) will be installed downgradient of the excavation.

- The upgradient injections points will be utilized for the initial injections in order to determine the rate of ISCO movement and to ensure horizontal and vertical distribution of the ISCO. Approximately 60% of the total volume of ISCO will be injected upgradient of the excavation in the lateral trench and deep injection points. Downgradient points will be monitored to determine how quickly the oxidant migrates and subsequent injections will be adjusted.

- The injection points installed within the excavation will be monitored for persulfate, pH, ORP, and temperature as the initial injection takes place.

- Chambers and Vertex will be testing the groundwater for the presence of the persulfate every 2 minutes for the first 30 minutes of the test and every 5 minutes thereafter. The test kit for the persulfate provides an immediate reaction along with providing semi-quantitative results. The test kit will immediately identify if the persulfate is present and at approximately what concentration. Vertex will also be relying on ORP and pH measurements. The ORP should increase in areas where the persulfate is actively oxidizing contaminants. The pH of the groundwater should also increase in the areas where the persulfate is active because the pH of the solution being injected ranges from 11-13. Temperature should also increase as the oxidizing reaction generates heat. The ORP, pH, and temperature measurements are instantaneous and will be conducted following the same schedule as the persulfate testing.

- If the persulfate is not detected in the excavation, the next phase of the ISCO implementation will involve injections into the excavation injection points (IP-6 through IP-9). Approximately 40% of the ISCO solution will be injected in the middle of the excavation via the injection points.

- During the injections into the excavation points, the recovery sump and downgradient injection points will be monitored for persulfate, pH, ORP, and temperature as the injection takes place. The downgradient injection points will be installed downgradient of the excavation, but upgradient of the point-of-compliance wells (17B-S1, 17B-S4, and 16B-S) in order to provide an extra level of protection to Logan Branch.

- If persulfate is observed at concentrations exceeding 3% in the downgradient injection points, a sodium thiosulfate solution will be mixed and injected into the downgradient points. The sodium thiosulfate will buffer the persulfate reaction and negate impacts to Logan Branch. Chambers will have a poly tank full of water, a pump, and the sodium thiosulfate standing by awaiting the testing/monitoring results.
- If the injections go as planned, ORP and pH in the downgradient injection points should increase slightly indicating a very slight persulfate reaction and no persulfate should be detected in the downgradient POC wells. The persulfate test will verify the presence and approximate concentration of the persulfate.
- The timing and rate of the injections will be refined based upon the data obtained from the initial treatment.

4.1 Surface Water Impact Contingency Plan

There is the potential for the ISCO solution to reach and impact Logan Branch during the course of groundwater remediation. The downgradient injection points were installed to identify if the persulfate is migrating towards the branch at unacceptable concentrations (above 3%). If persulfate is observed at concentrations exceeding 3% in the downgradient injection points, a sodium thiosulfate solution will be mixed and injected into the downgradient points. The sodium thiosulfate will buffer the persulfate reaction and negate impacts to Logan Branch.

If the sodium thiosulfate is not effective, Chambers will initiate groundwater extraction from the recovery sump. Chambers will utilize a 100 gpm pump to extract groundwater from the recovery sump thereby reversing the flow gradient and causing the oxidant to flow back towards the source area (i.e., away from Logan Branch). The extracted groundwater will be stored in a large capacity (at least 8,000 gallon) tank pending characterization and disposal. If the volume of extracted groundwater exceeds on-site storage capacity, several vacuum trucks will be mobilized to the site to extract groundwater and transport the water for disposal. Chambers will also monitor Logan Branch for persulfate, ORP, pH, and temperature to verify if the persulfate has impacted the stream.

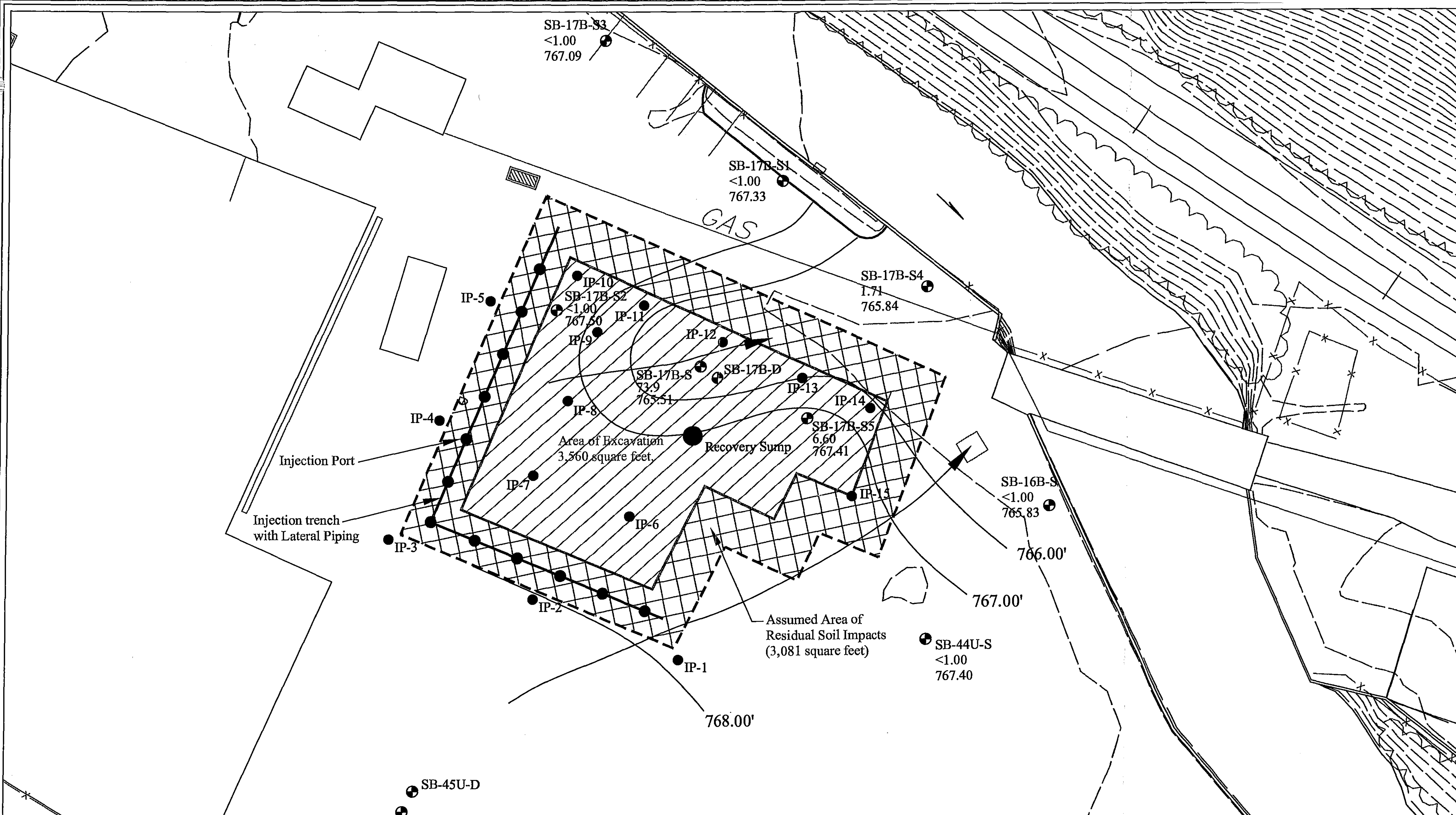
5.0 REFERNCES

Chambers, 2010. *Volume I of II, Remedial Investigation Report, Former Cerro Metal Products Bellefonte Facility, Spring Township, Centre County, Pennsylvania, PADEP Facility ID #14-17981*, Chambers Environmental Group, Inc., March 2010.

PA Code, 2001. Pennsylvania Code, Title 25, Environmental Protection, Pennsylvania Department of Environmental Protection, Chapter 250, Administration of Land Recycling Program. November 24, 2001.

PADEP, 1995. The Land Recycling Program, Land Recycling and Environmental Remediation Standards Act, Act 2. May 19, 1995.

PADEP, 2002. Pennsylvania Department of Environmental Protection. *Pennsylvania Land Recycling Program Technical Guidance Manual, V.1.* May 2002.



Prepared by:	Scale:	Legend:	Prepared For:	Title:
Chambers Environmental Group, Inc. 629 East Rolling Ridge Drive Bellefonte, PA 16823 P: 814-355-2241 F: 814-355-2410 www.chambersenvironmental.com	Scale: 1" = 20' 0 20 40 One Inch Equals Twenty Feet	- Surface Water Flow Direction - Groundwater Contour - Limits of Soil Excavation - Assumed Area of Residual Soil Impacts - Proposed Injection Point - Groundwater Flow Direction SB-44U-S <1.00 767.40 - Groundwater Monitoring Well - TCE Concentration (ug/L) - Groundwater Elevation (ft-amsl) - Injection Lateral	The Marmon Group Former Cerro Metal Products 2022 Axemann Road Bellefonte, PA 16823	*Plant 1* *Figure 1: Soil and Groundwater Remedial Work Plan Figure*

VERTEX

Environmental Inc.

239 Montrose St. North, Unit 1, Cambridge, ON, Canada. N3H 2J3
Tel: (519) 653-8444 Fax: (519) 653-8494 E-mail: info@vertexenvironmental.ca

April 28, 2010

Matthew C. Whitman
Project Manager
Chambers Environmental Group, Inc.
629 East Rolling Ridge Drive
Bellefonte, PA 16823

SUBJECT: OVERVIEW OF IN-SITU REMEDIATION OF TCE SUBSURFACE IMPACTS
FORMER CERRO METAL PRODUCTS
2022 AXEMANN ROAD, BELLEFONTE, PA 16823

Dear Mr. Whitman:

Vertex Environmental Inc. (Vertex) is pleased to present a work plan for the in-situ remediation of soil and groundwater impacted by volatile organic compounds (VOCs) at the above-mentioned site (the Site). Vertex has based this estimate on information provided by Chambers Environmental Group, Inc. (Chambers).

Background

Vertex's understanding of the Site is summarized as follows:

- The site is impacted primarily with trichloroethylene (TCE), in both soil and groundwater. The TCE concentration at SB-17B was 1,020 mg/kg at a depth of 0 to 2 ft below ground surface (bgs), 141 mg/kg at 8 to 10 ft bgs, and 1.43 mg/kg at 22 to 24 ft bgs.
- There is a stream adjacent to the site and there is hydraulic connection between the site and the stream.
- Field groundwater sampling performed in July 2009 at SB-17B-S, SB-17B-S4, SB-17B-S5, and SB-44U-S showed neutral pH, fairly high oxidation reduction potential (ORP), and depths to groundwater of 5.8 to 6.7 ft below top of casing.
- There is little presence of the by-products of natural reductive biodegradation of the TCE.
- An excavation of soils containing the highest concentrations was performed in November 2009, encompassing wells SB-17B-S and SB-17B-D. The dimensions of the excavation were 40 ft by 23 ft by 7 ft deep. A 4-foot diameter perforated

galvanized steel pipe was placed horizontally in the excavation to allow for future injection into the excavation. The excavation was backfilled with pea gravel.

- Sidewall samples were taken from 4 feet below ground surface (bgs) at the midpoint of each wall of the excavation, and were analyzed for VOCs. The TCE concentration of these samples varied between 82 and 213 mg/kg.
- Soil samples were submitted to Vertex for natural oxidant demand (NOD) testing, which yielded an NOD value of 5.3 g of persulfate per kg of soil (see separate memorandum summarizing testing results). This NOD is within the range of other ISCO projects Vertex has completed.

Remedial Objectives

Based on discussions with Chambers, it is understood that the remedial objectives for the Site are the following:

- Reduce TCE contaminant mass in soil and groundwater via in-situ remediation; and
- Ensure minimal impact to the nearby stream.

Remedial Approach

Vertex proposes to use in-situ injections to remediate the VOCs mentioned previously.

<u>Remedial Product</u>

Chemical oxidation is preferred over bioremediation because of several factors, including the following:

- Bioremediation of TCE occurs under reductive groundwater conditions. The groundwater ORP is high, so reversing this to encourage reductive bioremediation will be more difficult than at a site with naturally low ORP.
- Little to no natural reductive biodegradation is occurring as suggested by the lack of breakdown products that would be associated with such a process, including cis-1,2-dichloroethylene and vinyl chloride. Even if reducing conditions can be created and sustained, additional time would be required for the optimal consortium of microorganisms to develop and start to efficiently degrade the TCE to the end product ethene.
- Chemical destruction of the VOCs via oxidation is a more rapid process than reductive bioremediation, so a shorter remedial timeframe may be realized.

Vertex considers the chemical oxidants permanganate and persulfate to be applicable to the VOCs on Site. However, permanganate is not recommended because of the following characteristics:

- **Longevity**: It has been Vertex's experience that permanganate has excellent longevity in the subsurface (many months). Permanganate is bright purple in colour. Unfortunately this persistence and its colour would result in a higher likelihood of it reaching the stream.

- **Limited Solubility**: Typically permanganate is applied at field concentrations between 1 and 3% oxidant solution strength. Typically persulfate is applied at field concentrations of between 10 and 20% oxidant solution strength. It will take much less field time and cost to inject a given mass of persulfate compared to permanganate.

Vertex considers persulfate to be the most applicable oxidant for the site. Activated persulfate is capable of oxidizing TCE. It has a high oxidation potential to enable relatively rapid reactions with the target compounds, without the health and safety concerns of other powerful oxidants, such as Fenton's reagent.

<u>Area(s) of Impact</u>

The following assumptions were used to estimate the areas to target for in-situ injection:

- Unsaturated soils outside the area of excavation
- Saturated soils below and outside the area of the excavation

<u>Oxidant Mass Estimation</u>

To obtain an estimate of the mass of oxidant required, two parameters must be defined:

1) the mass of VOCs within the soil and groundwater, and
2) the mass of aquifer the oxidant will contact, combined with the natural oxidant demand of the soil

Vertex is capable of estimating the mass of oxidant that may be required once a targeted volume of the subsurface is determined.

<u>General Work Plan</u>

To address <u>unsaturated</u> soils outside the area of the previous excavation, the following steps can be taken:

1. Construction of a series of shallow trenches (potentially 1 to 2 ft bgs) around the perimeter of the previous excavation. Sections of perforated pipe would be installed in the trenches to create horizontal wells. Consideration would need to be given to the number of segments of wells, to allow appropriate control of oxidant solution distribution. Consideration to the distance between trenches would need to be given to ensure adequate distribution.

2. Regular injections of oxidant solution into the horizontal wells would be performed. The volume and pumping rate of each injection event would need to be considered, to ensure the soils become nearly saturated for a period of time.

3. Following two or three injection events, soil sampling could be performed to assess VOC levels. Should some areas be clean after these injections, the scope of additional injections could be decreased with confidence.

4. Additional injections could proceed to further reduce VOC levels as desired. Depending on the number of injections required, this process may take between 6 months and 1 year.

To address <u>saturated</u> soils under and outside the area of the previous excavation, the following steps can be taken:

1. Assessment or the impact of the unsaturated zone horizontal well injection system. If sufficient oxidant migrates downward, additional enhancements to the saturated zone may not be required. However, if additional injections are required, then:
2. Construction of a line of wells upgradient of the impacted area and downgradient of the area. Consideration as to the use of horizontal wells versus vertical wells would be required to ensure minimal construction costs and adequate ability to distribute oxidant solution in the subsurface.
3. Regular injections of oxidant solution into the upgradient wells could be performed simultaneously with extraction from the downgradient wells. This would create an enhanced gradient that will encourage rapid movement of the oxidant solution into the volume of subsurface that is being targeted. The volume and pumping rate of each injection event would need to be considered, to ensure the oxidant solution is covering the correct area, and to ensure there are no impacts to the adjacent stream.
4. The use of existing wells, potentially supplemented with additional observation wells, may be helpful in demonstrating distribution of the oxidant solution and in understanding any potential effects on the stream or other nearby areas.
5. Groundwater VOC samples can be taken periodically to track the concentrations over time and provide feedback as to whether additional injections are required.

Closing

For a summary of Vertex's qualifications, please refer to Appendix A.

If remediation is to proceed, Vertex could provide a detailed design.

I trust this satisfies your current requirements. Please do not hesitate to call the office with any questions at (519) 653-8444.

VERTEX ENVIRONMENTAL INC.

Bruce Tunnicliffe

Bruce Tunnicliffe, M.A.Sc., P.Eng.
Environmental Engineer

APPENDIX A

SUMMARY OF VERTEX'S QUALIFICATIONS

Overview

Vertex Environmental Inc. is a specialized remediation firm that specializes in in-situ remediation. Founded in 2003, Vertex was built on offering clients solutions to complex remedial challenges. Vertex is actively involved with remediation of petroleum hydrocarbons, chlorinated solvents, in addition to other contaminants, including polycyclic aromatic hydrocarbons, and heavy metals.

Technology Experience

Vertex staff has extensive experience in the design, implementation and optimization of in-situ remedial programs in a wide variety of geologic environments including till, alluvial deposits, fractured rock and karst. Remedial approaches that Vertex staff has experience with includes (but is not limited to):

1) Chemical Oxidation
    - Potassium and Sodium Permanganate,
    - Fenton's and Modified Fenton's Reagent,
    - Persulfate,
    - RegenOx, and
    - Ozone.

2) Chemical Reduction
    - Zero-Valent Iron,
    - Bimetals,
    - Dithionite,
    - Nanometals, and
    - Ferrous Sulfite.

3) Enhanced Bioremediation
    - Oxygen Releasing Compounds and Devices,
    - Hydrogen Releasing Compounds and Devices,
    - Wood Chips and Leaf Compost,
    - Organic Carbon,
    - Edible Oils,
    - Acetate and Lactate, and
    - Polymers.

4) Enhanced Mobilization
    - Ionic Surfactants,
    - Non-ionic surfactants,
    - Alcohol,
    - Other co-solvents, and
    - Heat.

5) Permeable Reactive Barriers
    - Zero-valent Iron Barriers,
    - Oxygen Releasing Barriers,
    - Hydrogen Releasing Barriers,
    - Precipitation and Co-Precipitation Barriers,
    - Sulfate Reducing Barriers, and
    - Ion Exchange and Adsorption Barriers.

6) Ex-Situ Approaches
    - Excavate and off-site disposal,
    - Excavate and on-site treatment (thermal, biopile, chemical treatment),
    - Pump & Treat,
    - Dual and Multiphase Extraction,
    - Soil Vapour Extraction,
    - Biosparging,
    - In-Situ Thermal, and
    - Soil Mixing.

Vertex staff has completed over 400 in-situ remedial projects across Canada and the United States. Prior to initiating any project, Vertex matches our clients' objectives with the technology that will best meet their objectives. Unlike many of our peers, Vertex is not "tied" to one reagent and/or technology. This flexibility allows Vertex to conduct a non-biased review of all appropriate technologies/reagents that may be applied to the site.

Staff Experience

One of the strengths of Vertex is our senior staff members, who combine an applied research and development background with extensive contracting and remediation experience:

Bruce Tunnicliffe, M.A.Sc., P.Eng. has direct experience with the design and /or application of over 100 in-situ remediation projects and holds a Masters Degree from the University of Waterloo in in-situ remediation technologies. Bruce has extensive experience in the application of oxidation and reductive technologies, in addition to "traditional" technologies such as pump and treat, multi-phase extraction and soil vapour extraction. Bruce has reviewed, designed, constructed, commissioned and monitored numerous remedial technologies in geologic media impacted by chlorinated solvents, petroleum hydrocarbons, and heavy metals contamination. Prior to forming Vertex, Bruce worked in consulting specializing in remedial option reviews and risk assessments. Bruce has numerous publications and has attended and presented at numerous conferences regarding remediation techniques and approaches.

Rick McGregor, M.Sc., MBA, CGWP, P.Geo. has over 15 years experience in groundwater and soil assessment and remediation and has worked in over 20 countries including Canada and the United States. Rick holds a M.Sc. from the University of Waterloo in hydrogeology and geochemistry and is a Certified Ground Water Professional. Prior to joining Vertex, Rick worked for the Canadian government's Wastewater Technology Centre as a research hydrogeologist and geochemist followed by tenure with a Canadian environmental engineering firm where he headed the Hydrogeology Division. Rick has extensive experience in in-situ remedial techniques including in-situ chemical oxidation and reduction, the design and installation of permeable reactive barriers, enhanced bioremediation of chlorinated and petroleum hydrocarbons and the treatment of heavy metals and oxyanions. Rick has served on numerous Canadian and American technical advisory committees and has authored over 30 technical papers. He has been an invited speaker at numerous conferences and workshops for the assessment, protection and remediation of groundwater.

David Hill, M.A.Sc., P.Eng., MBA

David Hill has significant experience in in-situ and ex-situ soil and groundwater remediation using a range of technologies, including chemical oxidation, aerobic bioremediation, chemical reduction, and enhanced anaerobic bioremediation. David has coordinated numerous large contracting projects in both the United States and Canada, and holds a Master's of Applied Science from the University of Toronto where he studied in-situ remediation techniques. He is a Licensed Professional Engineer in Ontario, Canada. Mr. Hill has over 10 years of environmental remediation experience.

VERTEX

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MEMORANDUM

To: Matthew C. Whitman

Company: Chambers Environmental Group, Inc.

From: David Hill

Subject: Summary of Natural Oxidant Demand Testing
Former Cerro Metal Products
2022 Axemann Road, Bellefonte, PA 16823

Date: December 31, 2009

Vertex Environmental Inc. (Vertex) has produced this memorandum summarizing the natural oxidant demand testing performed on soil samples from the above-mentioned site (the Site).

Natural Oxidant Demand

Natural Oxidant Demand (NOD) represents the amount of oxidant that may be consumed by a given quantity of soil. All soils naturally contain constituents such as reduced metal species and organic carbon that will be oxidized by an introduced chemical oxidant. As part of an assessment of oxidant loading at a Site, oxidant reaction with the soil (i.e. the NOD) is an important parameter to understand.

Three soil samples were received from the Site labeled as: slag, clean soil, and clay. The clean soil and clay samples were analyzed for 48 hour NOD, where the oxidation method was base-activated persulfate. The results for each of the soil types are reported in Table 1 below and reported as grams of persulphate per kilogram of soil.

Table 1. 48 hour Natural Oxidant Demand testing results

Sample Name	Date Collected	Date Analysis Commenced	Soil Description	NOD (g persulfate / kg soil)
Cerro Clean Soil	End Nov 2009	Dec 21, 2009	Dark brown moist silty-sand, with clay and gravel	5.3
Cerro Clay	End Nov 2009	Dec 21, 2009	Light brown moist clay, with silt	5.3

These values are in a typical range of soils Vertex has treated successfully in the field.

Limitations

The information, approach, and discussions presented in this memorandum are based on information recorded by Vertex Environmental Inc. from soil collected by Consultant at specific sampling locations at the Site. Conditions observed on the property or noted in documents regarding the property may differ from time to time and may become apparent during future investigations or on-site work. Observations are made for select sampling / observation points only, conditions between and beyond these sampling points may be different. As a result, some conditions may not have been detected or anticipated at the time of this work and as such Vertex Environmental Inc. cannot be held responsible for environmental conditions at the Site.

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Closing

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